

REMARKS

The application has been reviewed in light of the Office Action dated December 17, 2003. Claims 14-31 were pending. By this Amendment, new claims 32-35 have been added, and claims 14, 21-23, 26, 30 and 31 have been amended to place the claims in better form for examination and/or to clarify the claimed invention. Applicant submits that no new matter is added by this Amendment. Accordingly, claims 14-35 are now pending, with claims 14, 21-23, 30 and 35 being in independent form.

The Office Action states that the drawings are objected to under 37 C.F.R. §1.83(a).

Corrected drawings for Figures 1 and 7 are attached hereto as **Exhibit A**.

As discussed in the application at page 11, lines 1-7, for example, a thermometer 13, a power source 14 and a shim coil 15 jointly form a magnetic field correcting system. In addition, as discussed in the application at page 10, lines 21-27, for example, a computer 10 coupled with a sequencer 9 controls operation of the apparatus, and as discussed in the application in the paragraph bridging pages 13 and 14, for example, the power source may also have a control functionality.

Therefore, Applicant submits that all of the apparatus features are properly represented in the drawings.

Accordingly, withdrawal of the objection to the drawings is respectfully requested.

Claims 14, 21-23, 30 and 31 were objected to as purportedly having informalities.

By this Amendment, claims 14, 21-23 and 30 have been amended to place the claims in better form for examination.

Accordingly, withdrawal of the objection to the claims is respectfully requested.

Claims 14-31 were rejected under 35 U.S.C. §112, second paragraph, as purportedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Accordingly, withdrawal of the rejection under 35 U.S.C. §112, second paragraph, is respectfully requested.

Claims 14-31 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over U.S. Patent No. 4,663,592 to Yamaguchi et al. in view of U.K. Patent Application Publication No. GB 2 219 406 A to Warner.

Applicant has carefully considered the Examiner's comments and the cited art, and respectfully submits that independent claims 14, 21-23 and 30 are patentable over the cited art, for at least the following reasons.

This application relates to maintaining high uniformity of the static magnetic field in a magnetic resonance imaging (MRI) apparatus. Conventionally, MRI apparatuses require a substantially uniform (i.e. spatially) static (i.e. temporally) magnetic field in an examination space, in order to obtain an accurate image of a desired portion of the patient to be examined which is disposed in the examination space. However, many factors (such as space constraints, environmental conditions, etc.) affect the spatial uniformity of the temporally static magnetic field which is actually generated. Thus, one or more additional magnetic fields is typically generated (such as by using shimming coils or magnets) to correct for the spatial nonuniformity. However, temperature fluctuations can affect both (i) the static magnetic field over time which may render it not entirely static, and

(ii) local (i.e. spatial) variations in the static field, which may cause a spatial nonuniformity of the static field which is different than the known nonuniformity of the field under controlled conditions.

Applicant devised improvements to a magnetic resonance imaging apparatus which include making spatially-specific adjustments to the correction field according to detected temperature, in order to attain spatial uniformity in the static field. By this Amendment, independent claims 14, 21-23 and 30 have been amended to clarify these features in the claims, without narrowing the claimed invention.

Yamaguchi, as understood by Applicants, is directed to an NMR image forming apparatus wherein adjustments to a static magnetic field are made to compensate for degradation of the NMR image over time. A single, constant current  $I$  is supplied to plural coils which generate the static magnetic field. Yamaguchi discloses that the degradation may be attributable to temperature fluctuations over time. Yamaguchi teaches that the temperatures detected at various portions of the apparatus are measured, and the average temperature based on the measured values is used to make a correction to the static field as a whole. More specifically, the value of the current  $I$  supplied to the plural coils is adjusted according to the average temperature.

Accordingly, a single, constant current is applied to each of the plural coils, according to Yamaguchi. Applicant does not find a teaching or suggestion in Yamaguchi, however, that a spatial distribution of the additional magnetic field is adjusted based on the temperature detected by the temperature detecting unit, as provided by the claimed invention of this application.

Warner, as understood by Applicants, is directed to an electromagnet for an NMR apparatus. According to Warner, the

electromagnet generates a magnetic field having a region of homogeneity. Warner also discloses that the value of a current supplied to a control winding of the electromagnet may be changed based on a detected temperature. According to Warner, the magnetic field produced by the control winding may cancel the magnetic field changes produced by temperature changes over time. Warner does not disclose or suggest, however, provisions for correcting localized variations in the static field.

Moreover, Applicants find no disclosure or suggestion in Warner, however, of a spatial distribution of the additional magnetic field is adjusted based on the temperature detected by the temperature detecting unit, as provided by the claimed invention of this application, as provided by the claimed invention.

Since the cited art does not disclose or suggest each and every feature of the claimed invention, the cited art does not render the claimed invention unpatentable.

Accordingly, for at least the above-stated reasons, Applicants respectfully submit that independent claims 14, 21-23 and 30, and the claims depending therefrom, are patentable over the cited references.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition, and the Commissioner is authorized to charge the requisite fees to our Deposit Account No. 03-3125.

The Office is hereby authorized to charge any additional fees that may be required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the

undersigned attorney.

Allowance of this application is respectfully requested.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Paul Teng", is written over a horizontal line.

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